

# The Preservation of Meaning: The Significant Properties of Our Virtual Museum

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The *significant properties* approach to digital preservation focuses on identifying and preserving the essential characteristics that confer value and meaning to digital objects.

This method ensures that the core attributes of a digital asset are maintained over time, even as technology evolves. This paper looks at how significant properties methodology has been applied to virtual reality environments by Library Services at the University of Bristol.

Digital objects often have significant properties that give them context and meaning. For instance, a VR experience might be valued for its visual fidelity, interactivity, or historical accuracy. Identifying and preserving these properties ensures the object retains its intended purpose; as technologies become obsolete, preserving the significant properties allows for the migration of digital objects to new platforms while maintaining their essential characteristics. This adaptability is crucial for long-term access and usability.

For immersive technologies, user experience is a key factor. The significant properties approach ensures that the experiential aspects, such as navigation, interactivity, and sensory engagement, are preserved, allowing future users to share in today's experience.

Our current preservation workflow for the Uncertain Space virtual museum relies upon thorough documentation of those properties deemed significant. This transparency aids future users in understanding the rationale behind preservation decisions and ensures consistency in how digital objects are managed over time. To apply the significant properties approach to 3d digital environments, we determined which aspects of the experience were critical to preserve. These fell into the following broad categories:

Visual and auditory quality: Resolution, color fidelity, sound clarity

Interactivity: User controls, responsiveness, and interaction models

Spatial fidelity: Accurate representation of 3D spaces and object

Narrative and content: The storyline or educational content within the VR experience

The process of documenting these 'families' of properties and explaining and how they contribute to the overall experience involves the creation of descriptive metadata about the VR experience, technical specifications and dependencies, and contextual

information about creation and intended use. Preservation strategies can then be tailored to maintain our significant properties.

For our museum, our preservation strategies are;

- Emulation: Running the VR experience on future platforms that mimic the original hardware and software environment
- Migration: Converting the VR experience to newer formats while maintaining the significant properties
- Snapshotting: Capturing comprehensive snapshots of the VR environment, including state information and user interactions

Our significant properties were established by consultation with a cross section of different user groups. Presented here are those which relate specifically to the VR version of the Uncertain Space.

#### Primary

- Smooth locomotion with snap rotation option
- Teleportation locomotion
- Player collision with visible meshes
- Object grabbing/dropping
- Passive trigger volumes (e.g. for media playback)
- Spatial audio
- Video textures with audio
- Level reset
- Exit

#### Secondary

- Passive teleportation via trigger volume
- Dynamic lighting
- Hand tracking (no controllers)
- Collision with invisible blocking volumes
- Manual switch to control AV content

- Active switch to trigger events (e.g. open door)
- Skeletal meshes & animations
- Multiplayer
- In game image/video capture
- In-game web browser
- Change item size in game

Periodically reviews take place to reexamine the significant properties and the preservation strategies to ensure they remain relevant and effective as technologies and standards evolve.

The success of our approach very much depends on user-centered testing; involving users in testing the preserved VR experiences to ensure that the significant properties are effectively maintained, and the intended experience is still delivered.

By using the significance properties approach, institutions can ensure that VR experiences are preserved in a way that maintains their core attributes and value, allowing future generations to access and benefit from these immersive digital environments.